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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/067,029	02/04/2002	Narayan Sundararajan	884.594US1	4992
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INTEL/BLAKELY 12400 WILSHIRE BOULEVARD, SEVENTH FLOOR LOS ANGELES, CA 90025-1030			EXAMINER STRZELECKA, TERESA E	
			ART UNIT	PAPER NUMBER
			1637	

DATE MAILED: 11/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/067,029	Applicant(s) SUNDARARAJAN ET AL.	
	Examiner Teresa E. Strzelecka	Art Unit 1637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 18, 19 and 21-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 18, 19 and 21-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on September 19, 2005 has been entered.

2. Claims 18, 19 and 21-23 were previously pending. Applicants amended claim 18. Applicants' amendments did not overcome any of the rejections presented previously, therefore they are maintained. Applicants' arguments are addressed below in the "Response to Arguments" section. New grounds of rejections were added.

Response to Arguments

3. Applicant's arguments filed September 19, 2005 have been fully considered but they are not persuasive.

Regarding the rejection of claims 18, 19 and 21-23, Applicants argue that the nanotubes of Dai et al. are not capable of suspension in liquid, since they are attached to a substrate. First, "suspendable in liquid" can have a lot of different meanings, one of which is that it can be simply put into a liquid. Then the term "suspendable" in claim 18 applies to the molecular identification assembly, not to the nanotubes themselves. Dai et al. specifically states "Note that in this case, the nanotube device operates in a liquid environment." (col. 5, lines 62, 63). Therefore, the device of Dai et al. is "suspendable" in liquid. Further, as can be seen from Fig. 2 of Dai et al., the nanotube surface is all exposed except for the ends which are attached to electrodes, therefore, the nanotube itself is also "suspendable". Thus, Dai et al. anticipates this new limitation.

The rejection is maintained.

Claim interpretation

4. Before proceeding with the rejections, interpretation of claim limitations is provided.

A) Modification of a friction coefficient of a nanotube is interpreted as resulting from changing the chemical composition of a nanotube. Any such chemical composition change will result in modification of a frictional coefficient, according to Applicants' definition of a frictional coefficient: "A friction coefficient, by definition, describes forces of interaction between at least two objects or surfaces. A friction coefficient can be described as including both an abrasive component, and an adhesive component. Abrasive friction is defined as primarily a mechanical interaction between two objects. In one example of abrasive friction, resistance to movement at an interface between two objects is generated by asperities on the surface of the objects rising past each other or breaking off. In contrast, adhesive friction is defined as primarily a chemical interaction between two objects. A friction coefficient may be determined either by abrasive factors, adhesive factors, or a combination of the two." (specification, page 2, lines 25-30; page 3, lines 1-3).

The limitations of increasing or decreasing a frictional coefficient of nanotubes refer to a measurement of a relative quantity, i.e., the same chemical modification of a nanotube measured against two different chemical surfaces may result in either decrease or increase in the friction coefficient.

Since any chemical modification changes friction coefficient of a nanotube, the steps of modifying a frictional coefficient of a nanotube and attaching the nanotube to a reactive molecule are interpreted as being the same step. Therefore, attaching a functional group to a nanotube will

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inherently either increase or decrease its frictional coefficient, depending against which substrate the frictional coefficient is measured.

Therefore, the limitation of increasing or decreasing the frictional coefficient of the nanotube does not add any additional structural limitations to the product claims.

B) The terms "reactive molecule", "chemical modifier" and "assay molecule" were not defined by Applicants, therefore they are interpreted as any molecules. Consequently, the reactive molecule can be the same as the chemical modifier and the same as assay molecule.

C) The term "portion of the carbon nanotube" has not been defined, therefore, two different atoms of the nanotube are considered to be in two different portions.

D) The term "suspendable" has not been defined by Applicants, therefore it is interpreted as meaningⁱⁱ capable of being suspended in a liquid.ⁱⁱ However, this term does not impart any structural limitation on the claimed product, as it refers to the manner of operating the device (see MPEP 2114):

APPARATUS CLAIMS MUST BE STRUCTURALLY DISTINGUISHABLE FROM THE PRIOR ART

>While features of an apparatus may be recited either structurally or functionally, claims< directed to >an< apparatus must be distinguished from the prior art in terms of structure rather than function. >*In re Schreiber*, 128 F.3d 1473, 1477-78, 44 USPQ2d 1429, 1431-32 (Fed. Cir. 1997) (The absence of a disclosure in a prior art reference relating to function did not defeat the Board's finding of anticipation of claimed apparatus because the limitations at issue were found to be inherent in the prior art reference); see also *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 228-29 (CCPA 1971);< *In re Danly*, 263 F.2d 844, 847, 120 USPQ 528, 531 (CCPA 1959). "[A]pparatus claims cover what a device *is*, not what a device *does*." *Hewlett-Packard Co. v. Bausch & Lomb Inc.*, 909 F.2d 1464, 1469, 15 USPQ2d 1525, 1528 (Fed. Cir. 1990) (emphasis in original).

MANNER OF OPERATING THE DEVICE DOES NOT DIFFERENTIATE APPARATUS CLAIM FROM THE PRIOR ART

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus

from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (The preamble of claim 1 recited that the apparatus was "for mixing flowing developer material" and the body of the claim recited "means for mixing ..., said mixing means being stationary and completely submerged in the developer material". The claim was rejected over a reference which taught all the structural limitations of the claim for the intended use of mixing flowing developer. However, the mixer was only partially submerged in the developer material. The Board held that the amount of submersion is immaterial to the structure of the mixer and thus the claim was properly rejected.).

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 18, 19 and 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Hamon et al. (Adv. Mater., vol. 11, pp. 834-840, 1997).

Regarding claim 18, Hamon et al. teach a molecular identification assembly comprising:

a reactive molecule (Hamon et al. teach reactive molecules of $-\text{CONH}-4-\text{C}_6\text{H}_4(\text{CH}_2)_{13}\text{CH}_3$ attached to atoms of the carbon nanotube (page 837, Scheme 2).);

a carbon nanotube attached to the reactive molecule (Hamon et al. teach reactive molecules attached to different atoms of the carbon nanotube (page 837, Scheme 2).);

a chemical modifier attached to a portion of the carbon nanotube separate from the reactive molecule, the chemical modifier altering the friction coefficient of the carbon nanotube (Hamon et

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al. teach chemical modifier molecules of $-\text{CONH}-4-\text{C}_6\text{H}_4(\text{CH}_2)_{13}\text{CH}_3$ attached to different atoms of the carbon nanotube than the reactive molecules (page 837, Scheme 2). Therefore, the reactive molecules and the chemical modifiers are attached to different portions of the nanotube. Since Hamon et al. teach attachment of molecules to the nanotube, they teach attachment of chemical modifiers, which inherently change the friction coefficient of the nanotube.);

wherein the molecular identification assembly is suspendable in a liquid (Hamon et al. teach solubilizing the nanotubes in liquid (page 838), therefore, they teach that they are suspendable in liquid.).

Regarding claim 19, Hamon et al. teach an assay molecule of $-\text{CONH}-4-\text{C}_6\text{H}_4(\text{CH}_2)_{13}\text{CH}_3$ attached to atoms of the carbon nanotube (page 837, Scheme 2).

Regarding claim 21, Hamon et al. teach a chemical modifier comprising a carboxylic acid group (page 837, Scheme 2).

Regarding claims 22 and 23, Hamon et al. teach attachment of chemical modifiers to the nanotube, therefore, as explained in the "Claim Interpretation" section, they inherently teach increasing or decreasing the frictional coefficient of the nanotubes.

7. Claims 18, 19 and 21-23 are rejected under 35 U.S.C. 102(e) as being anticipated by Dai et al. (U.S. Patent No. 6,528,020 B1; cited in the previous office action).

Regarding claim 18, Dai et al. teach a molecular identification assembly comprising:

a reactive molecule (Dai et al. teach a nanotube device comprising electrodes, therefore, they teach reactive molecules which constitute the electrodes. The electrodes can be nickel-gold or titanium-gold, therefore the reactive molecules are gold, zinc and titanium (col. 2, lines 17-20; col. 4, lines 29-32).)

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a carbon nanotube attached to the reactive molecule (Dai et al. teach a nanotube device comprising electrodes deposited on both ends of a carbon nanotube (col. 2, lines 15-20; col. 4, lines 23-34).); and

a chemical modifier attached to a portion of the carbon nanotube separate from the reactive molecule, the chemical modifier altering the friction coefficient of the carbon nanotube (Dai et al. teach modifying the nanotube by coating or decorating it with one or more sensing agents (= chemical modifiers), such as metal particles, polymers and biological species. In particular, Dai et al. teach deposition of gold onto the nanotube and attachment of thiol groups to gold. Thiol is modified with carboxylic functional group (col. 2, lines 28-32; col. 5, lines 32-43 and 51-63; Fig. 5 and 7A). Therefore, since Dai et al. teach attachment of molecules to the nanotube, they teach attachment of chemical modifiers, which inherently change the friction coefficient of the nanotube.);

wherein the molecular identification assembly is suspendable in a liquid (Dai et al. teach binding of avidin in solution to carbon nanotubes derivatized with thiol molecules by operating the device in liquid (col. 5, lines 51-63). Therefore, Dai et al. inherently teach suspendable molecular assembly.

Regarding claim 19, Dai et al. teach an assay molecule, since they teach gold, zinc or titanium electrodes, therefore they teach molecules of gold, titanium and zinc (col. 2, lines 17-20; col. 4, lines 29-32). Since Applicants did not define the term “assay molecule”, these molecules are considered to be assay molecules.

Regarding claim 21, Dai et al. teach thiol molecules (= chemical modifier) with carboxylic functional groups (col. 5, lines 51-63).

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Regarding claims 22 and 23, Dai et al. teach attachment of chemical modifiers to the nanotube, therefore, as explained in the "Claim Interpretation" section, they inherently teach increasing or decreasing the frictional coefficient of the nanotubes.

8. No claims are allowed.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Teresa E. Strzelecka whose telephone number is (571) 272-0789. The examiner can normally be reached on M-F (8:30-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (571) 272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

November 4, 2005

TERESA STRZELECKA
PATENT EXAMINER

Teresa Strzelecka